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Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended to clarify Applicants disclosed invention and new claims added.

For example support for the amendments is found in the Specification at:

Beginning at page 21, line 14:

"A typical process flow sequence for a photoresist-developing procedure in implementation of the present invention is summarized in FIG. 5. In step S1, the knife ring is raised to an upper position in the developer dispensing apparatus, defining a gap distance of typically from about 0.1 mm to about 0.4 mm between the upper edge of the knife ring and the backside of the wafer. In step S2, a selected quantity of the developing liquid is dispensed onto the upper, patterned surface of the wafer to form a puddle of the developing liquid on the wafer. Simultaneously, the wafer is rotated at selected rotational speeds to draw the developing liquid over the surface of the wafer for uniform distribution of the developing liquid over the wafer. The small gap distance between the upper edge of the knife ring and the backside of the

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wafer tends to retard flow of the developing liquid across the wafer backside to the wafer chuck by capillary action. In step S3, the puddle development stage, the developing liquid remains on the photoresist on the wafer to develop the photoresist, as is known by those skilled in the art. In step S4, the knife ring is lowered in the apparatus until the upper edge of the knife ring is disposed at a gap distance of typically from about 1.4 mm to about 1.5 mm with respect to the backside of the wafer. This facilitates thorough rinsing and removal of developing liquid from the wafer backside in step S5 by optimizing flow of rinsing liquid between the backside of the wafer and the upper edge of the knife ring as jets of the rinsing liquid are subsequently directed from beneath the wafer against the wafer."

Beginning at page 16, line 1:

In use, the vertical position of the knife ring is initially adjusted such that the upper edge of the knife ring is disposed at a gap distance of from typically about 0.1 mm to about 0.4 mm with respect to the backside of the wafer. As the developing liquid is dispensed onto the wafer, this gap distance is sufficient to prevent or at least substantially reduce flow of the developing liquid from the upper surface of the wafer, around the wafer edges, along the backside of the wafer and to the wafer chuck, respectively, by capillary action. After processing, the gap distance is subsequently adjusted to a value of typically from about 1.4 mm to about 1.5 mm, wherein the knife ring is disposed in the lower position beneath the wafer, to facilitate thorough rinsing of the developing liquid from the wafer backside and enhance passage of the rinsing fluid and removed developing liquid between the upper edge of the knife ring and the wafer backside.

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Beginning at page 15, line 12:

"In a typical embodiment, the adjustable knife ring is suitable for a TEL (Tokyo Electron Limited) developer dispensing apparatus and has a diameter of about 290 mm for a wafer having a 300 mm diameter. However, the knife ring may be suitably sized and adapted for other types of developer dispensing apparatus and is suitable for use with wafers having a diameter of 200 mm."

Claim Rejections under 35 USC 103

1. Claims 1-14 stand rejected under 35 USC 103(a) as being unpatentable over Tanaka et al. (US 5,689,749).

Tanaka et al. discloses a double edged seal ring (item 40; Figures 2,3, 4, 5) having an inner rings edge (42; Figures 8A-8D) for preventing rinse liquid flow (60) past a gap (clearance) (59) (i.e., rinse liquid is held in place at clearance 59) defined by a clearance between the inner ring and the substrate backside (col 7, lines 32-36; lines 46-50). The outer ring edge (43) prevents developer fluid (50; Figures 8A-8D) dispensed on the top of the wafer from flowing past the clearance (59) between the outer ring and the substrate backside (see col 8, lines 15-30; or, if some developer flows past the clearance it is collected in groove (41) between the inner and outer rings and discharged.

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In another embodiment, a single seal ring (24; Figure 11) **with a flat upper surface** (col 9, lines 33-39) operates to form (trap) a liquid film between the clearance (59) created between the flat upper face of the ring and the backside of the substrate **for both the developer solution and the rinse liquid** (col 9, lines 44-47; col 10, lines 34-44; lines 47-54; claims 1 and 5). The creation of the liquid film in the gap (59) during the rinsing process removes the developer from the gap (59) (col 10, lines 53-54).

In both embodiments, **the ring (single or double) is fixed by bolts to a lower cup during the development process** (col 5, lines 52-56 (Figures 4, 13, items 24h, 24d).

Tanaka et al. discloses **carrying out tests in a development process** (including both applying development solution and rinse fluid) where the gap (clearance) (59 or B) was varied (implicitly **by bolting the ring in place prior to the development process** with varying clearances) over a range of 0.5mm to 1.5mm (col 8, lines 55 - col 9, line 27. The results for preventing flow of both rinsing liquid and developer was found to depend primarily on the width of the top face of the ring (col 9, lines 15-26).

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Thus, Tanaka et al. fail to disclose several aspects of Applicants disclosed and claimed invention including:

"An apparatus for dispensing a liquid onto a substrate frontside and backside during a development process and adjustably controlling liquid flow on said substrate backside during said development process to improve a rinsing step,"

Nowhere to Tanaka et al. disclose or suggest an apparatus that can accomplish the function of **"adjustably controlling liquid flow on said substrate backside during said development process to improve a rinsing step"**

Tanaka et al. further nowhere disclose:

"a knife ring having a base and a tapered edge extending from said base, said knife ring vertically adjustably mounted beneath said support;"

Tanaka et al. further nowhere disclose:

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"a plurality of **independently-actuated automatic vertical adjustment mechanisms** operably engaging said base of said knife ring **for placing said knife ring at selected vertical positions beneath the substrate during said development process.**"

Examiner argues that it is old and well known to substitute automatic arrangement for manual arrangements (to achieve the same result), citing *In re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958). Assuming *arguendo* that *In re Venner* is applicable law, Examiner has not shown in the prior art Applicants apparatus (knife ring as claimed) or an apparatus that is taught to be capable of accomplishing Applicants disclosed and claimed invention or of achieving the same results (**adjustably controlling liquid flow on said substrate backside during said development process**).

"Finally, the prior art reference (or references when combined) **must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

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"Finally, when evaluating the scope of a claim, every limitation in the claim must be considered. Office personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered." See, e.g., *Diamond v. Diehr*, 450 U.S. at 188-189, 209 USPQ at 9.

Moreover, nowhere do Tanaka et al. recognize or provide a solution to the problem that Applicants have recognized and solved by their disclosed and claimed invention:

"An apparatus for dispensing a liquid onto a substrate frontside and backside during a development process and adjustably controlling liquid flow on said substrate backside during said development process to improve a rinsing step,"

Rather, the apparatus of Tanaka et al. presents the very problem that Applicants disclosed and claimed invention solves.

Conclusion

The cited reference does not produce Applicants disclosed and claimed invention and therefore is insufficient to make out a *prima facie* case of obviousness with respect to both Applicants independent and dependent claims.

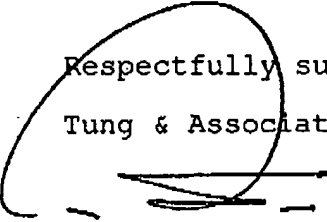
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Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited."

In the event that the present invention as claimed is not in condition for allowance for any reason, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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